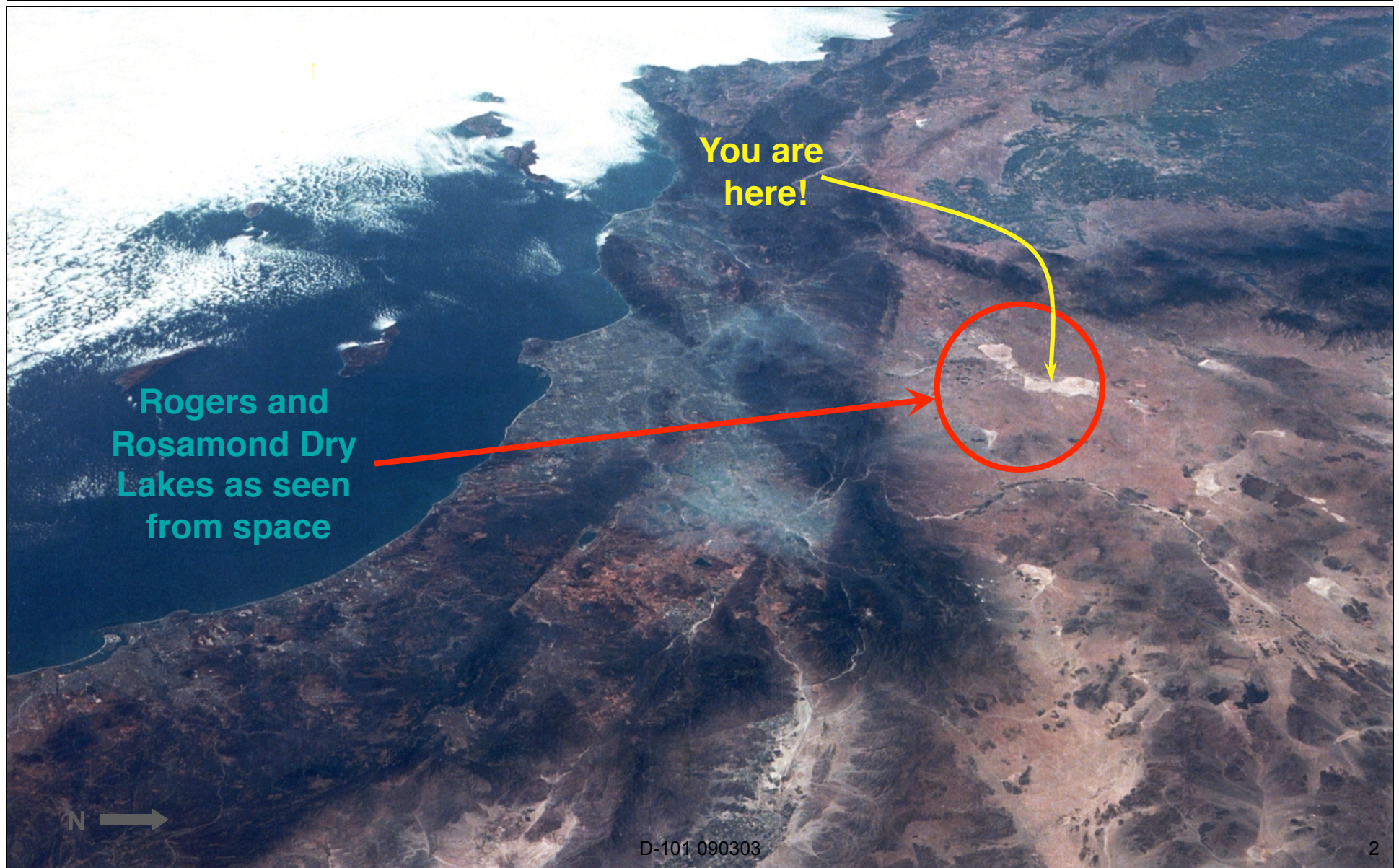
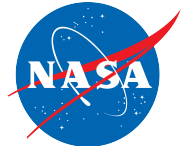


Dryden Flight Research Center

Center Overview

Dryden Flight Research Center

Edwards Air Force Base



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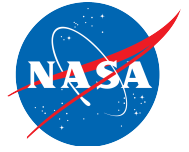
Dryden Flight Research Center

Edwards Air Force Base

- Remote Location
- Varied Topography
- 350 Testable Days Per Year
- Extensive Range Airspace
- 29,000 Ft Concrete Runways
- 68 Miles of Lakebed Runways
- 301,000 Acres
- Supersonic Corridor

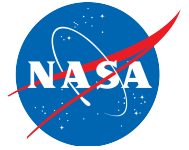
Dryden Aircraft Operations Facility

Palmdale, CA



- Palmdale Site 9 Complex
 - Ready access to USAF Plant 42 runway and facilities
 - 40 miles from NASA Dryden Flight Research Center

Our Namesake



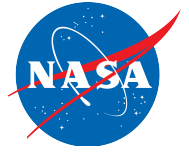
The NASA Dryden Flight Research Center was named after Dr. Hugh L. Dryden, the final Administrator of NACA and the first Deputy Administrator of NASA. The following is his explanation as to why there is a need for flight research,

“ . . . to separate the real from the imagined and to make known the overlooked and the unexpected. . . ”.



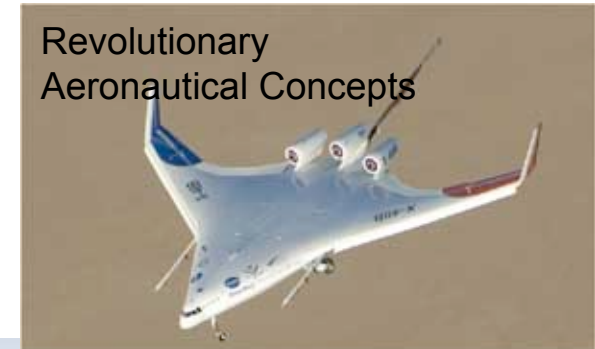
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Advancing Technology and Science Through Flight



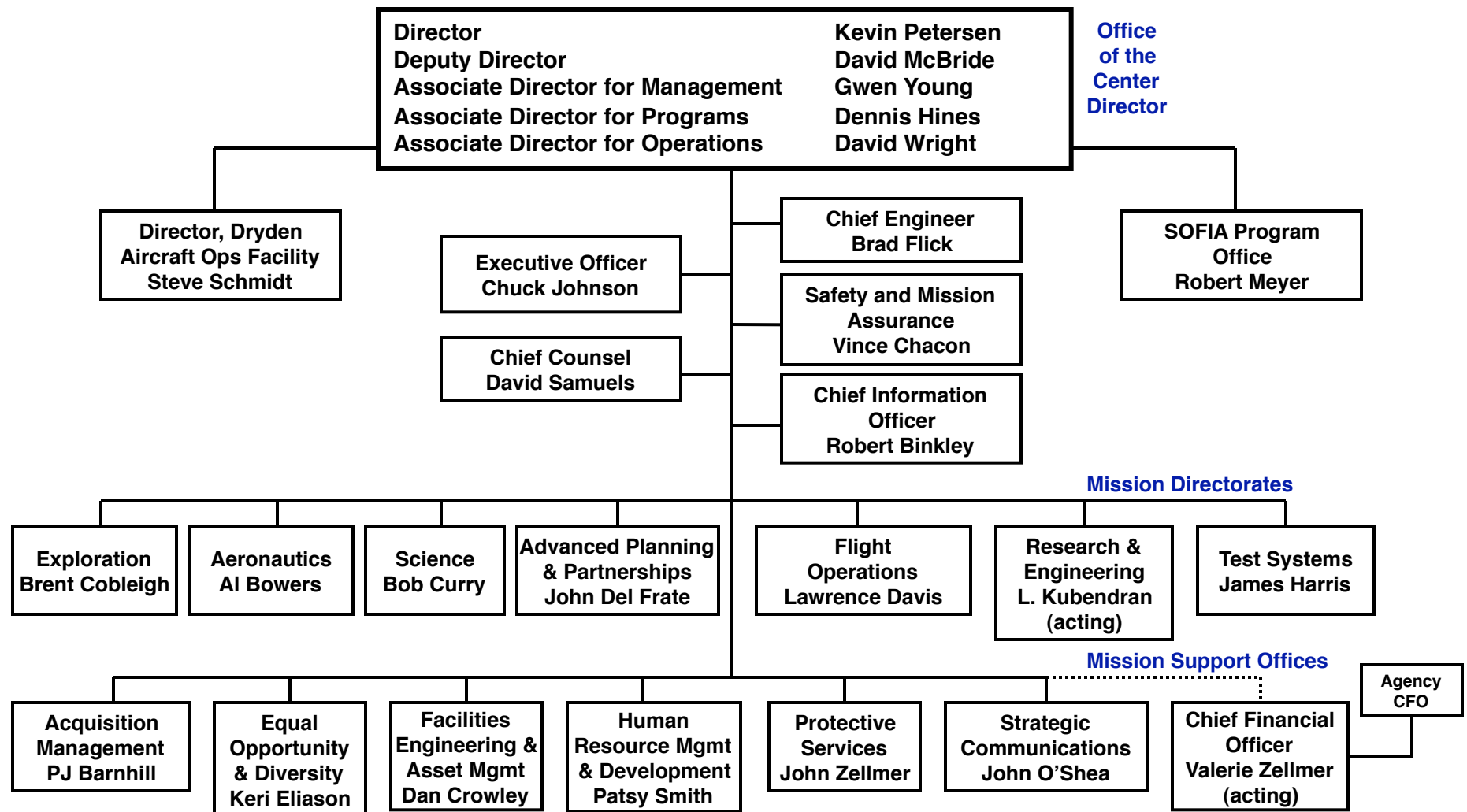
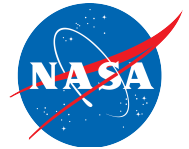
- Mission Elements
 - Perform flight research and technology integration to revolutionize aviation and pioneer aerospace technology
 - Validate space exploration concepts
 - Conduct airborne remote sensing and science observations
 - Support operations of the Space Shuttle and the ISS

... for NASA and the Nation



D-101 090303

Dryden Flight Research Center



Summary of Dryden Capabilities



- Core Competencies
 - Atmospheric Flight Research and Test
 - Flight Safety and Risk Management
 - Flight Project and Mission Management
 - Flight Research Technology
 - Flight Test Operations
 - Experimental Aircraft - piloted and unpiloted
- Facility Capability
 - Flight Operations & Engineering Staff
 - Experimental and Testbed Aircraft
 - Unmanned Aircraft Systems
 - Extensive experience in securing Certificates of Authorization (COA) for UAS flights
 - Airborne Science Platforms
 - Range and Aircraft Test Facilities
 - Western Aeronautical Test Range
 - Research Aircraft Integration Facility
 - Flight Loads Laboratory



FY09 Vital Statistics:

Civil Servant Staff

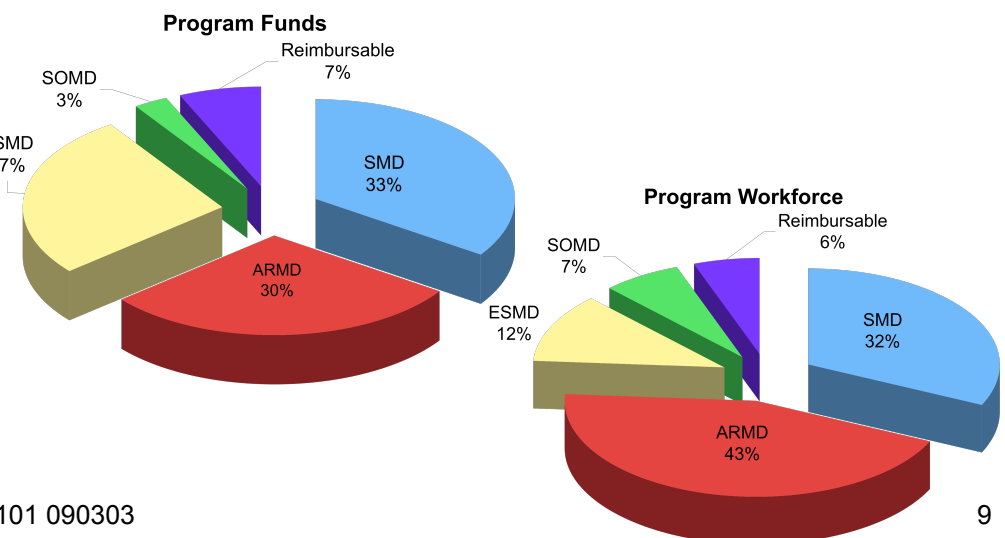
~ 560

On-site Contractors

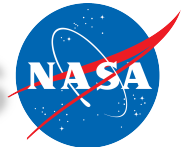
~ 650

Budget

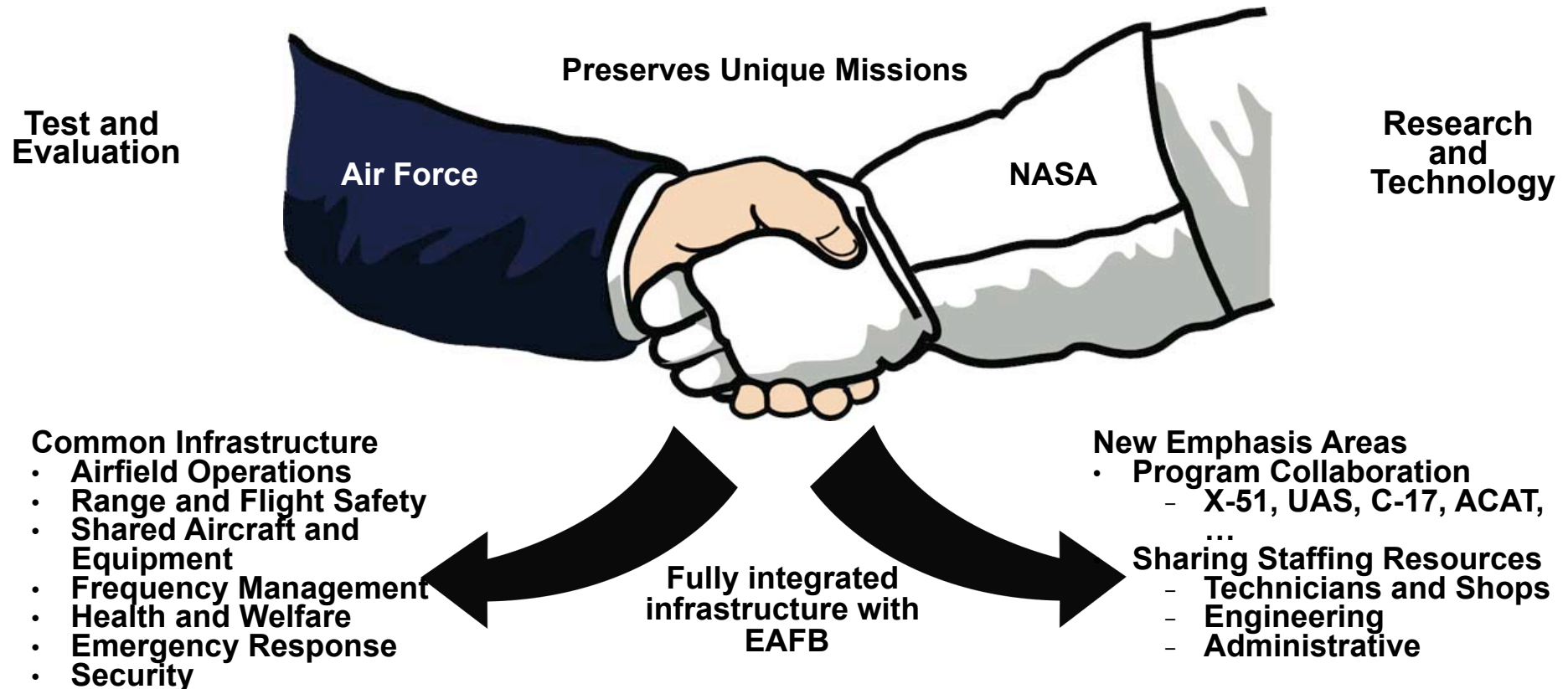
~ \$247M



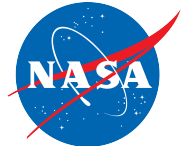
DFRC/AFFTC/AFRL Alliance Activities



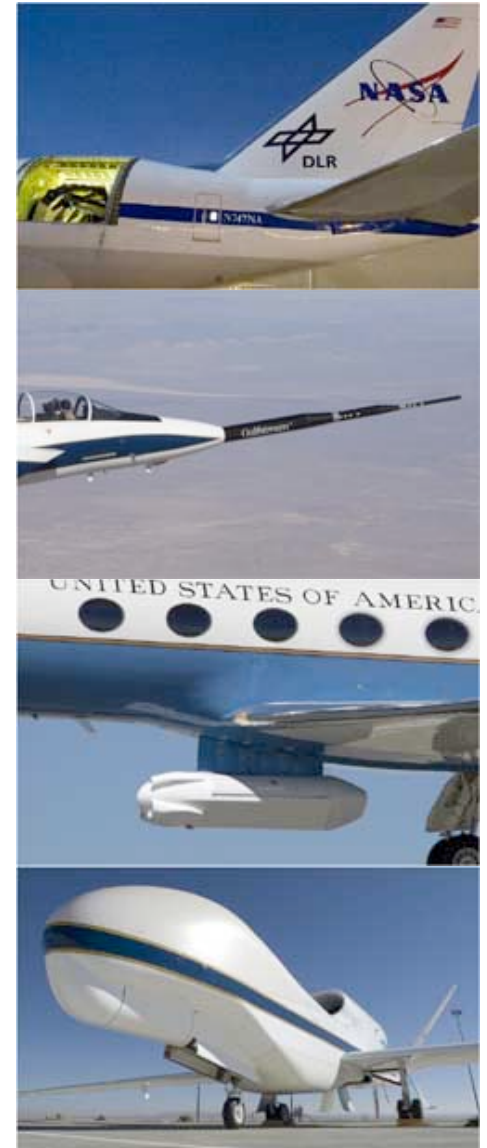
- DFRC/AFFTC/AFRL Alliance
 - Co-Chaired council meets quarterly
 - 8 integrated product teams
 - 33 active Memorandum of Agreements
 - Over \$86M in cost avoidance/savings to date



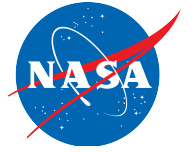
Strategic Partnerships



- DoD Partnerships:
 - USAF, AFFTC Alliance, AFRL,
 - USN, NAVAIR,
 - US Army, CERDEC
 - DARPA
- International
 - DLR Deutsches Zentrum für Luft- und Raumfahrt (German Aerospace Center), Cranfield (UK), ...
- Industry
 - Boeing, Lockheed Martin, Gulfstream, Northrop Grumman, AeroVironment, General Atomics, Scaled Composites, ...
- Academia
 - AERO Institute
 - Multiple university grants
- NASA Centers
 - ARC, GRC, GSFC, JPL, JSC, KSC, LaRC, MSFC
- Airborne Science
 - Departments of Agriculture, Energy, Homeland Security, and Interior
 - NOAA, EPA



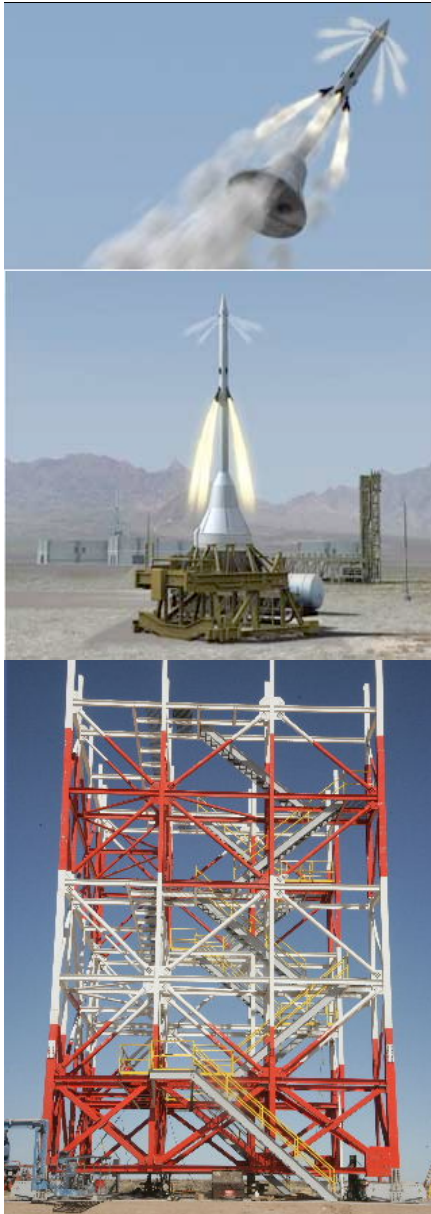
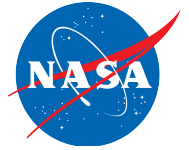
Mission Activity



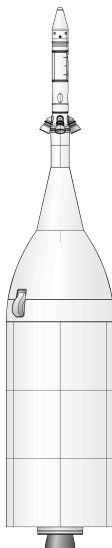
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Exploration Systems

Orion Launch Abort Flight Test

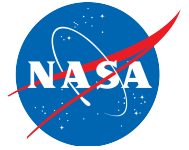


- Orion crew exploration vehicle includes a launch abort system (LAS) that assures crew escape after failure
- Lead Flight Test Vehicle Development and Test
 - Systems Engineering & Integration
 - Safety and Quality Assurance
 - Development Flight Instrumentation
 - Abort Test Booster Procurement Lead
 - Crew Module Integration and Test
 - Launch Facilities & Ground Support
 - Equipment Lead Flight, Ground, & Range Operations



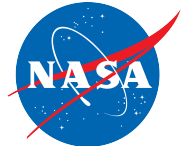
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Aeronautics Research



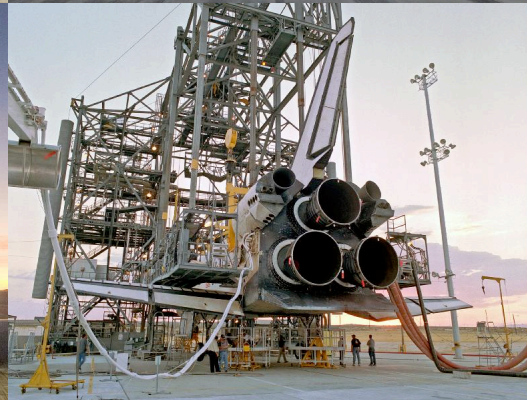
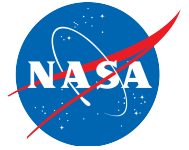
- Fundamental Aeronautics Program
 - Subsonic Fixed Wing
 - Supersonics
 - Hypersonics
- Aviation Safety Program
 - Integrated Resilient Aircraft Control
 - Integrated Vehicle Health Management
- Airspace Systems Program
 - UAS in the National Airspace System in support of JPDO
- Reimbursable/Partnerships (2011 SPG 1.4.4)
 - Technology Development
 - Systems Integration
 - Systems Validation

Airborne Science Program



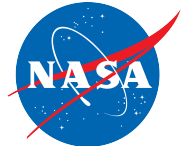
- Aligned with the Science Mission Directorate's Airborne Science Program
 - Program Objectives
 - Satellite Calibration and Validation
 - New Sensor and Algorithm Development
 - Process Studies
 - Next Generation NASA Scientist and Engineer Development
- Platforms
 - DC-8
 - Heavy lift
 - Long Range
 - Shirt-sleeve environment
 - ER-2
 - Very High Altitude
 - Long Range
 - G-III UAVSAR
 - Synthetic Aperture Radar
 - Repeat pass interferometry
 - Global Hawk
 - Unmanned
 - Extreme range and endurance

NASA Space Operations



- Primary alternate landing site
- On-orbit communications support for International Space Station (ISS) and Shuttle Orbiter
- Telemetry support
- Shuttle Carrier Aircraft (SCA) maintenance and support

Current Research: Ikhana



- Modified Predator-B UAV
- Environmental Research and Sensor Technology (ERAST) program
- Long-endurance/high-altitude: 32 hours @ 52,000 ft
- Over-the-horizon control, AI collision-avoidance demonstrator
- Observation, climate monitoring, search and rescue, wildfire support
- 700 lbf instruments long endurance or 3,000 lbf science payload short endurance



NASA Dryden Flight Research Center Photo Collection

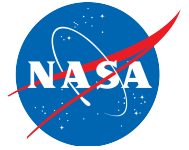
<http://www.dfrc.nasa.gov/Gallery/Photo/index.html>

NASA Photo: ED06-0208-3 Date: October 25, 2006 Photo By: General Atomics Aeronautical Systems, Inc.

Equipped with a pod-mounted infrared imaging sensor, the Altair UAS aided fire mapping efforts over wildfires in central and southern California in late 2006.

Partners: *General Atomics Aeronautical Systems, USFS*

Current Research: X-48B



- 8.5% scale remotely piloted technology demonstrator
- Advanced nacelle placement and design
- Supercritical airfoil shape
- Currently in flight test for validation and verification
- Advanced aerodynamic design could provide huge improvements in efficiency

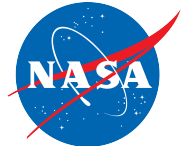


NASA Dryden Flight Research Center Photo Collection
<http://www.dfrc.nasa.gov/Gallery/Photo/index.html>
NASA Photo: ED06-0198-50 Date: October 24, 2006 Photo By: Tony Landis

Boeing's sub-scale X-48B Blended Wing Body technology demonstrator shows off its unique lines on the vast expanse of Rogers Dry Lake adjacent to NASA Dryden.

Partner: *Boeing Phantom Works, Cranfield Aerospace*

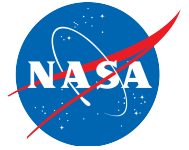
Current Research: ER-2



- High altitude civil U2 derivative, 410 kt at 75,000 ft.
- Can reach 65,000 ft in 20 min, range 6,000+ nm, endurance 10 hrs.
- Earth resources, celestial observations, atmospheric chemistry and dynamics, oceanic processes, electronic sensor R/D, satellite calibration / data validation, hurricane prediction, cloud formation, etc, etc, ...
- Numerous spectral and atmospheric measurement partnerships with other NASA centers, USAF, NOAA, EPA, private industry, and universities



Current Research: F-15B IFCS



- Artificially intelligent direct-adaptive neural network controller
- Aviation safety, damaged airframe recovery, pilot augmentation, AI systems research
- Modified pre-production F-15B, canards + thrust vectoring
- Digital failure logic via ARTS-II research controller
- Soon to move to F/A-18 aircraft due to F-15B #837 retirement

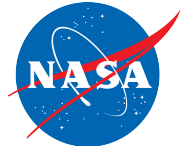


NASA Dryden Flight Research Center Photo Collection
<http://www.dfrc.nasa.gov/Gallery/Photo/index.html>
NASA Photo: EC03-0231-1 Date: August 27, 2003 Photo By: Jim Ross

NASA Dryden's highly-modified F-15B aircraft, tail number 837, serves as an Intelligent Flight Control System (IFCS) research testbed aircraft.

Partners: NASA ARC / ISR / Boeing

Current Research: F-15B Testbed

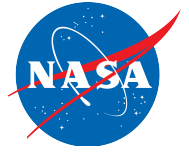


- “The Flying Wind Tunnel”
- Aerodynamic component testing and flight research
- Flight systems research
- Full, scale, and component level testing of propulsion systems coming soon



Partners: Various

Current Research: Global Hawk



- Demilitarized combat UAV
- Long endurance earth science missions
- Measuring, monitoring, and observing remote areas of the earth not easily accessible by other aircraft
- 30-hour endurance
- 2000 lbf payload
- 11,000 NM range

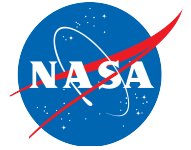


NASA Dryden Flight Research Center Photo Collection
<http://www.dfrc.nasa.gov/Gallery/Photo/index.html>
NASA Photo: ED08-0309-18 Date: December 11, 2008 Photo By: Tony Landis

One of NASA's two Global Hawk unmanned high-altitude aircraft shows off its blue-and-white livery in front of its hangar at the Dryden Flight Research Center.

Partners: Northrop Grumman

Current Research: DC-8 Flying Lab



- advanced on-board lab equipment and scientific instruments
- variety of Earth Science mission support
- climate monitoring and atmospheric research
- Arctic and polar research
- crop yields and agricultural studies
- air quality



NASA Dryden Flight Research Center Photo Collection

<http://www.dfrc.nasa.gov/Gallery/Photo/index.html>

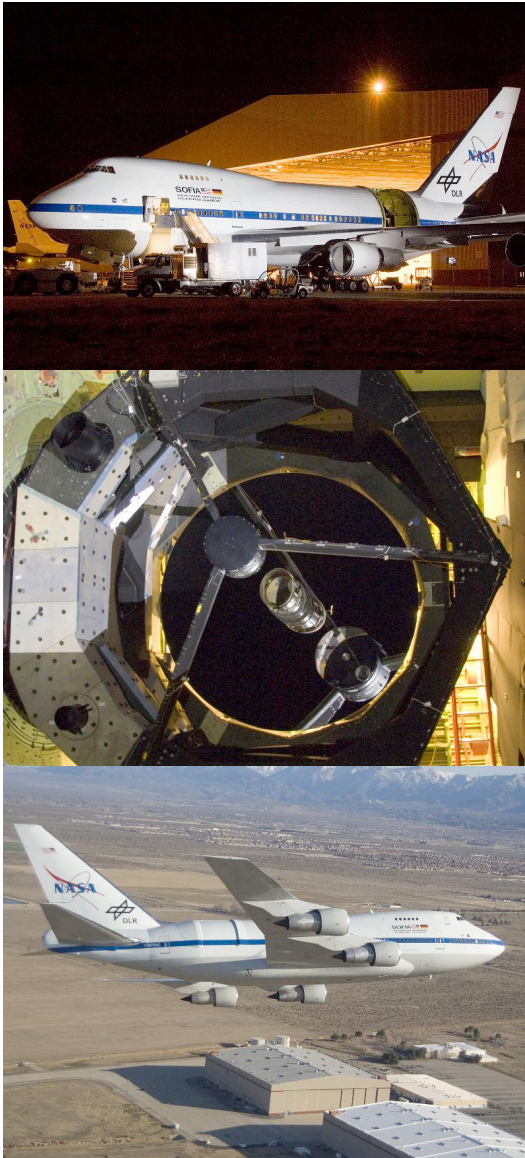
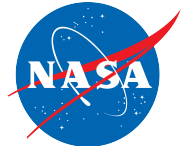
NASA Photo: EC04-0047-04 Date: February 24, 2004 Photo By: Jim Ross

NASA's Airborne Science DC-8, displaying new colors in a check flight Feb. 24, 2004, over the Dryden Flight Research Center.

Partners: NOAA, EPA, USFS, other various

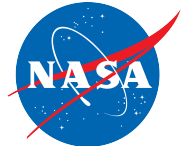
SOFIA

Stratospheric Observatory for Infrared Astronomy



- SOFIA will provide astronomers with a key infrared window to the Universe
 - Energetics of Luminous Galaxies
 - Origin of Stars and Planetary systems
 - Gas and Grain Chemistry of the Interstellar Medium
 - Structure of our Solar System
- Joint program by NASA and DLR (Deutsches Zentrum für Luft und Raumfahrt)
- Science Mission Operations - Universities Space Research Association (USRA) ,Deutsches SOFIA Institut (DSI)
- Major aircraft modifications:
 - German-built 100-inch (2.5 meter) diameter far-infrared telescope weighing 20 tons mounted in the rear fuselage
 - Mission and support systems
 - Mission Control and Communications System (MCCS)
 - Education and Public Outreach work stations Flight test operations

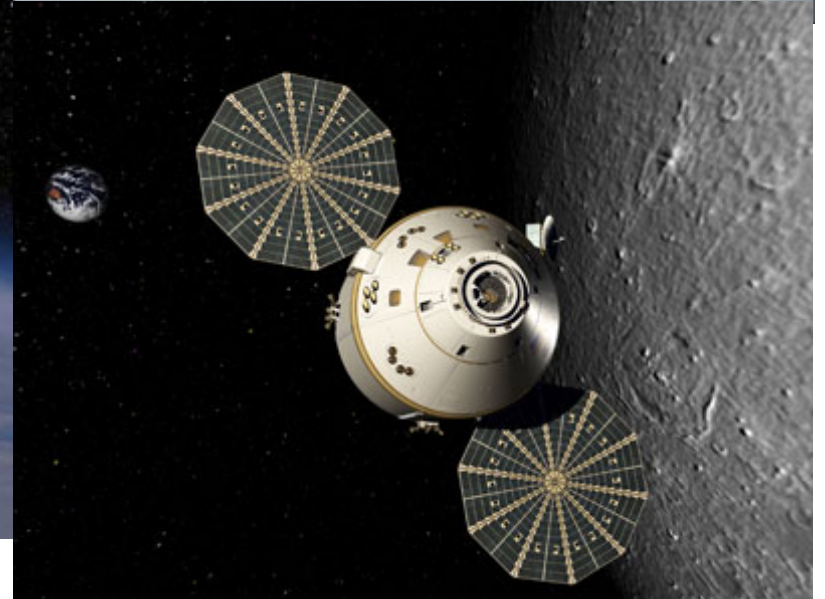
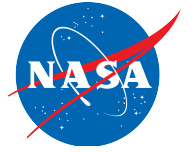
Testbed Aircraft



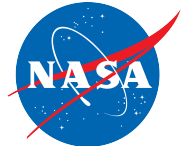
- Testbed aircraft augmenting Dryden's one-of-a-kind research aircraft are available to support a wide variety of research missions.
 - Dragon Lady (ER-2)
 - Eagle (F-15)
 - Global Hawk (RQ-4)
 - Gulfstream (G-III)
 - Hornet (F/A-18)
 - Ikhana (MQ-9)
 - King Air (B-200)
 - Mentor (T-34)
 - Talon (T-38)
- Testbeds provide platforms for sensor validation, aerodynamic, system, and propulsion research and test.



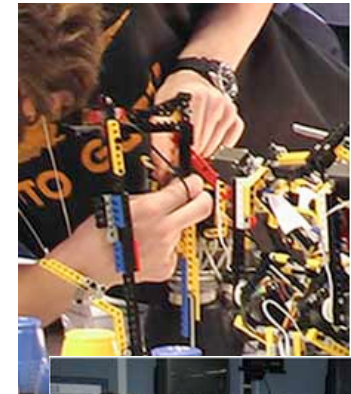
VSE / Constellation / Orion



Education and Public Outreach



- NASA Robotics Education Project (REP)
- Math Odyssey
- Science, Technology, Engineering, and Mathematics Talent Expansion Program (STEP)
- Teacher Training
- NASA Explorer School (NES)
 - G.C. Cole Middle School, CA
 - Black Mountain Middle School, AZ
 - Edwards Middle School, CA
 - Flagstaff Middle School, AZ
 - Kennedy Elementary School, CA
 - Westwind Intermediate School, AZ
 - Arrowhead Elementary School, AZ
- Educator Resource Center
- NASA Aerospace Exploration Gallery
- NASA Aerospace Education, Research and Operations (AERO) Institute
 - Serves as innovator, facilitator and integrator for joint NASA, University and Industry projects
 - Leverages the assets of NASA, other government agencies, academia and industry
 - Creates strategic private/public partnerships



Questions?



